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(54) Title of the utility model: Ink supplying device

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## SPECIFICATION

### 1. TITLE OF THE UTILITY MODEL

INK SUPPLYING DEVICE

### 2. WHAT IS CLAIMED IS:

An ink supplying device, arranged by coupling an ink head and an ink supply source, the ink supplying device wherein a hollow needle-like member, forming an ink flow path, is disposed on a coupled surface side of the ink head, a stopper member, formed of elastic material, is disposed at a position of a coupled surface side of the ink supply source corresponding to the hollow needle-like member, and in the coupled state, the hollow needle-like member pierces through the stopper member and forms a flow path leading from an ink-containing portion of the ink supply source to an ink holder of the ink head.

### 3. DETAILED DESCRIPTION OF THE UTILITY MODEL

[Field of the Utility Model]

This utility model concerns an ink supplying device, which is arranged by coupling an ink head and an ink supply source and is favorable for use in an inkjet printer.

[Prior Arts]

Among conventional inkjet printers, there are arrangements, wherein a head, which discharges ink onto a recording medium, and an ink supplying device, which serves as an ink supply source for the head, are equipped as separate bodies at separated positions and these components are connected

via an ink supplying system that includes a supply tube or other communicating member.

However, generally with such an inkjet printer, since a long supply tube is required, the laying of the tube was troublesome, and evaporation of ink and mixing in of air tended to occur readily.

In regard to this point, the present Applicant has disclosed an inkjet printer of an arrangement, wherein a head and an ink supply source are formed as an integral member, in Japanese Patent Application No. Sho-60-91236. The invention of this Japanese Patent Application No. Sho-60-91236 not only enables the above issues of ink evaporation and mixing of air to be resolved but also provides the merit that, due to not requiring tubing, the handling of the head and the ink supplying system, including the ink supply source, is facilitated. However, there was an issue in terms of cost in that when the consumption of ink progresses and the remaining amount of ink in the ink supply source becomes low or there is no more ink, the head, which is expensive in comparison to an ink-containing pack and other members making up the ink supply source, is exchanged at the same time.

[Problems Solved by the Utility Model]

The making of the head and the ink supply source detachable so that an integral assembly is arranged in a coupled state and just the ink supply source can be exchanged upon consumption

of ink may be considered. However, in this case, ease of coupling in the process of connecting the head and the ink supply source, prevention of ink leakage in the coupled state and in an exchanging process, definite communication of ink in the coupled state, etc., must be secured.

[Object]

In view of the above issues, an object of the present utility model is to provide an ink supplying device, with which an ink head and an ink supply source can be coupled and separated readily, leakage of ink will not occur in a coupled state nor in an exchange process, and a state of definite communication of ink can be secured in the coupled state.

Another object of this utility model is to provide an ink supplying device by which the running cost of inkjet printer can be made low.

[Means for Solving the Problem]

In order to achieve the above objects, with this utility model, a stopper member, formed of an elastic material, is mounted on an ink supply source, an ink head, which is coupled to the ink supply source, is provided with a hollow needle-like member at a position corresponding to the stopper member, and when the ink supply source and the ink head are coupled, the hollow needle-like member pierces through the stopper member to form a flow path, leading from an ink-containing portion of the ink supply source to an ink holder of the ink head.

#### [Actions]

With the present utility model, since the hollow needle-like member of the ink head is made small in outer diameter and the stopper member is arranged as an elastic body, even if the hollow needle-like member is pulled out during the exchanging of the ink supply source, the diameter of the hole in the stopper member will be small and since the hole diameter will shrink to an even smaller size due to the elasticity of the member, there will be no or hardly any outflow of ink from the ink supply source.

Furthermore, at the ink head side, since the inner diameter of the hollow needle-like member is made small, there will be hardly any leakage of ink during the exchanging of the ink supply source.

#### [Embodiments]

Embodiments of this utility model shall now be described with reference to the drawings.

##### First Embodiment

FIG. 2 shows the outer appearance of a first embodiment of this utility model. Here 1 is a back case, which makes up an ink supply source of an inkjet recording device and is also be referred to as an ink cartridge. 2 is a pack body with resilience, which is housed in back case 1 and in which ink is filled in advance, and this is also referred to as an ink tank (ink-containing portion). 3 is a substantially flat cover,

which is mounted on an open side of pack body 2 and is fixed to one end of back case 1. Also, 4 is a substantially flat front case, which is detachably coupled to the cover 3 side of back case 1, has an ink holder 12 that receives the supply of ink from pack body 2 inside back case 1, and is also referred to as an ink head. 11 is a circuit board, affixed to a front surface side of ink head (front case) 4, 13 is a head plate, affixed above circuit board 11, and 14 indicates ink discharge outlets, a plurality of which are opened in head plate 13. Ink, which is introduced into ink holder 12 of ink head 4, is made into liquid drops that are made to fly out from ink discharge outlet 14 by drive signals applied to circuit board 11 and thereby discharged towards paper or other recording medium.

FIG. 3 shows the outer appearance of the above-described device of the embodiment in the separated state. Here, 5 indicates a plurality of positioning and latching pins, formed protrudingly at predetermined positions of a back surface (coupled surface) of ink head 4, and these are fitted into pin receiving grooves 23, formed at outer edge portions of cover 3. As shown in FIG. 4A, which is a perspective view, and FIG. 4B, which is a sectional view of a central portion, 6 is a stopper member, having a small-diameter groove 6a at a substantially central portion and having a thin portion 6b formed at a bottom portion of the groove. This stopper member 6 is fixed to a substantially central portion of the front surface of cover

3 by a stopper fixing member 7.

9 is a hollow needle-like member, which is protrudingly fixed at a position of the back surface (coupled surface) of ink head (front case) 4 corresponding to groove 6a of the above-mentioned stopper member 6. When ink head 4 and ink supply source 1 are coupled, the tip of hollow needle-like member 9 pierces through thin portion 6b at the bottom portion of the groove of stopper member 6, thereby forming an ink flow path from ink-containing portion 2 of the ink supply source to ink holder 12 of ink head 4.

10 is a protective rib for protecting hollow needle-like member 9, and the tip of hollow needle-like member 9 is of a height such that it does not protrude beyond rib 10. Protective rib 10 is formed at a position at which it enters into a groove portion 3a, provided at a corresponding position of cover 3, in the coupled state.

With the above-described arrangement, as back case (ink cartridge) 1 is inserted and becomes attached to ink head (front case) 4, tip 10a of protective rib 10 enters into groove portion 3a of cover 3. Positioning in directions orthogonal to the insertion direction is enabled by the inner diameter of groove portion 3a being set to a snug-fit dimension that is slightly larger than the outer diameter of protective rib 10.

With further insertion, the tip of hollow needle-like member 9 becomes inserted into groove 6a of stopper member 6

and eventually comes in contact with thin portion 6b. The inner diameter of groove 6a of the stopper member is set somewhat smaller than the outer diameter of hollow needle-like member 9, and the hollow needle-like member is thus inserted without gaps forming at the inner surface of groove 6a.

With further insertion from the state in which the tip of hollow needle-like member 9 contacts thin portion 6b, hollow member 9 pierces through thin portion 6b and, at the same time, latching pins 5 become fitted into pin receiving grooves 23 as mentioned above, thereby completing the coupling.

FIG. 5 shows a central longitudinal section of the coupled state of the ink supplying device described above, and via the hollow member, which pierces through thin portion 6b of stopper member 6, ink 8 flows from ink-containing portion 2 of the ink supply source into ink holder 12 in ink head (front case) 4 and is discharged from ink discharge outlet 14.

For exchange of ink, pins 5 are disengaged from pin receiving grooves 23 and ink supply source (back case) 1 is moved away from ink head (front case) 4 in the direction of arrow A in FIG. 1 to pull out and separate hollow needle-like member 9 from groove 6a of stopper member 6. Here, hollow needle-like member 9 is arranged to be narrow and needle-like, and its inner diameter is set to a small diameter (for example, approximately 0.3mm) of a value such that clogging by ink 8 will not occur, and its thickness is made thin (for example,



0.1mm thickness in the case of a metal). Thus even when hollow member 9 is extracted from groove 6a during the exchange of ink, hardly any of ink 8 will flow out. Moreover, protective rib 10, which is formed in the periphery of hollow member 9 in order to provide completeness and protection, not only prevents a finger from contacting hollow needle-like member 9 but also prevents slight amounts of ink, which flow out from hollow member 9, from splashing and becoming attached to a finger.

Meanwhile, since the inner diameter of groove 6a of stopper member 6 is set to a diameter (for example, a diameter of 0.3 to 0.4mm) that is somewhat smaller than the outer diameter of hollow member 9, residual ink inside ink-containing portion 2 is prevented from flowing out during ink exchange.

#### Second Embodiment

FIG. 6 shows a second embodiment of this utility model.

The differences with respect to the first embodiment are that a stopper member 106 has a small-diameter through hole 106a formed at a substantially central portion thereof and, in the state of being mounted on cover 3, is compressed in a central direction by inner walls of stopper fixing member 7 so that through hole 106A is closed. Thus even when ink supply source 1 is separated from ink supply source 1 and handled as a single unit during ink exchange, no ink whatsoever will flow out. Moreover, it is known that, generally in order to obtain

normal ink discharge from a head of an inkjet printer, the ink pressure in the ink flow path must be constantly kept at a negative pressure, and in the present embodiment, since the interior of ink-containing portion 2 of the ink supply source is kept at a negative pressure even in the state in which ink supply source 1 is separated, even when, for example, a user erroneously separates ink supply source 1, it can be coupled again and used as it is.

Other portions of the second embodiment are practically the same as those of the first embodiment and corresponding portions are expressed with the same numbers and detailed description thereof shall be omitted.

The same actions and effects as those of the above-described first embodiment are provided with the second embodiment as well.

#### [Effects of the Utility Model]

As has been described above, with the present utility model, since a stopper member, formed of an elastic material, is mounted on the ink supply source and a hollow needle-like member is disposed at a position of the ink head corresponding to the stopper member, the outflow of ink from the ink supply source and mixing in of air are prevented during the exchanging of the ink supply source and the outflow of ink and mixing in of air from the ink head side can also be restrained to the minimum. An ink supply device can thus be provided with which

the attachment and detachment of the ink head and the ink supply source can be performed readily, leakage of ink does not occur in the coupled state nor in the exchange process, and a state of definite communication of ink is provided in the coupled state.

Also, since the head does not have to be exchanged when the ink runs out, the effect of reducing the running cost is provided.

#### 4. BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal sectional view of a separated state that best illustrates the characteristics of a first embodiment of an ink supplying device by the present utility model, FIG. 2 is an external perspective view of the ink supplying device of FIG. 1, FIG. 3 is an external perspective view showing the separated state of the ink supplying device of FIG. 2, FIGS. 4A and 4B are a perspective view and longitudinal sectional view, respectively, of a stopper member in FIG. 1, FIG. 5 is a longitudinal sectional view of the coupled state of the ink supplying device of FIG. 1, and FIG. 6 is a longitudinal sectional view of the separated state of a second embodiment of this utility model's ink supplying device.

1 --- ink supplying device (ink cartridge), 2 --- ink-containing portion, 4 --- ink head, 6 --- stopper member, 8 --- ink, 9 --- hollow needle-like member, 12 --- ink holder.